Final Record of Decision for Site 5 Soils

162nd Fighter Wing
Arizona Air National Guard
Tucson International Airport Superfund Site
Tucson, Arizona

August 1996

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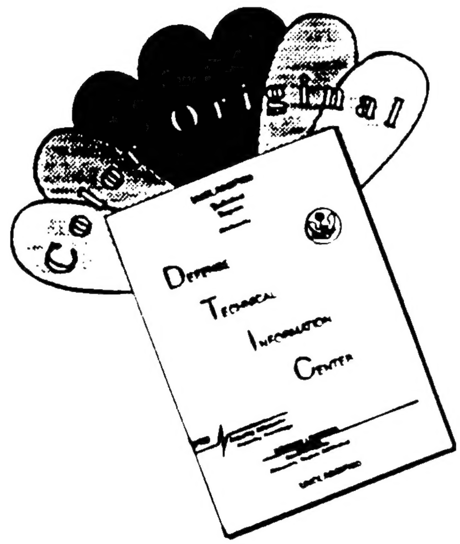

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This decision document presents the selected soil remedial action for the AANG Base in Tucson, Arizona. The remedial action was chosen in accordance with the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), as amended by the Superfund Amendments and Reauthorization Act (SARA), and to the extent practicable , the National Contingency Plan (NCP). This decision is based on the administrative record for this site.

The State of Arizona and the United States Environmental Protection Agency, Region IX concur on the selected remedy.

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Arizona Air National Guard
Tucson International Airport Superfund Site
Tucson, Arizona

August 1996

Prepared For:

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LIST OF ACRONYMS

Acronym	Definition
1,1,1-TCA	1,1,1-trichloroethane
1,1,2-TCA	1,1,2-trichloroethane
1,2-DCA	1,2-dichloroethane
AANG	Arizona Air National Guard
ADEQ	Arizona Department of Environmental Quality
ANG	Air National Guard
ARARs	applicable or relevant and appropriate requirements
ARCC	Allowable Residual Contamination Concentration
bgs	below ground surface
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
EPA	United States Environmental Protection Agency
FS	feasibility study
HBGLs	Health Based Guidance Levels
MCLs	Maximum Contaminant Levels
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NGB	National Guard Bureau
PCE	tetrachloroethylene
RI	remedial investigation
RODs	record of decisions
SARA	Superfund Amendments and Reauthorization Act
SVE	soil vapor extraction
TCE	trichloroethylene
TIAA	Tucson International Airport Area
UCAB	Unified Community Advisory Board
VOCs	volatile organic compounds
µg/l	micrograms per liter

SECTION I

DECLARATION

Site Name And Location

162nd Fighter Wing, Arizona Air National Guard (AANG)
Tucson International Airport Area (TIAA) Superfund Site
Tucson, Arizona

Statement of Basis and Purpose

This decision document presents the selected soil remedial action for the AANG Base in Tucson, Arizona. The remedial action was chosen in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), as amended by the Superfund Amendments and Reauthorization Act (SARA), and, the extent practicable, the National Contingency Plan (NCP). This decision is based on the administrative record for this site.

The State of Arizona and the United States Environmental Protection Agency, Region IX, concur on the selected remedy.

Assessment of the Site

Releases of trichloroethylene (TCE) have contaminated the vadose zone and ground water at Site 5 (Old Wash Rack) at the AANG Base. Actual or threatened releases from Site 5, if not addressed by implementing the response action selected in this Record of Decision, may present an imminent and substantial endangerment to public health, welfare, or the environment.

Description of the Selected Remedy

The selected remedy for Site 5 includes extraction of contaminated vapors from soils and treatment of offgases using activated carbon. The cleanup level for TCE and other VOCs detected in soil vapor is set to reduce the impact of these compounds to less than Maximum Contaminant Levels (MCLs; established under the Safe Drinking Water Act) in the upper subunit of the upper regional aquifer. The cleanup level is selected for protection of ground water. The cleanup level is determined by using the most recent EPA-approved version of the VLEACH/mixing cell model to demonstrate that the impact of residual soil vapor concentrations on ground water is below MCLs.

The National Guard Bureau anticipates that cleanup will be achieved in 1 year or less.

Statutory Determinations

The selected remedy is protective of human health and the environment, complies with Federal and State requirements that are legally applicable or relevant and appropriate to the remedial action, and is cost-effective. This remedy utilizes permanent solutions and alternative treatment (or resource recovery) technologies to the maximum extent practicable and satisfies the statutory preference for remedies that employ treatment that reduces toxicity, mobility, or volume as a principal element. Because this remedy will not result in hazardous substances remaining on site above health-based levels, the 5-year review will not apply to this action.

SIGNATURES:

FOR NATIONAL GUARD BUREAU:

Signature — Date: 9 Sep 96

Donald W. Shepperd
Major General, USAF
Director, Air National Guard

FOR U.S. ENVIRONMENTAL PROTECTION AGENCY:

Signature — Date: 10/15/96

Daniel Opalski
Director, Federal Facilities Compliance Branch
U.S. Environmental Protection Agency, Region IX

FOR STATE OF ARIZONA:

Karen J. Heidel, Deputy for

Signature — Date: 11-20-96

Russell F. Rhoades
Director
Arizona Department of Environmental Quality

SECTION II

DECISION SUMMARY

Site Name and Location

General information regarding the site name and location are discussed below.

Site Description

The Arizona Air National Guard (AANG) Base is in the northeast corner of the Tucson International Airport Area (TIAA) Superfund Site, Pima County, southeastern Arizona. The street address for the Base is 1500 Valencia Road, Tucson, Arizona (Figure 1).

Base History

The AANG Base has been in operation since flight activities began in the 1950s. The 162nd Fighter Wing operates at the Base training pilots from across the nation and from countries throughout the world. Present operations at the AANG Base consist of aircraft maintenance, vehicle maintenance, and fueling of aircraft and vehicles. Some of the historical operations at the AANG Base have resulted in disposal of hazardous wastes on the land surface. Today, many safeguards exist at the AANG Base to ensure that hazardous wastes are not released to the environment.

Site Discovery

In early 1981, United States Environmental Protection Agency (EPA) and Arizona Department of Health Services identified trichloroethylene (TCE) in ground water in the upper zone of a regional ground water aquifer underlying areas in the vicinity of TIAA. In response to this finding, the National Guard Bureau (NGB) has initiated extensive soil and ground water investigations to determine if contamination existed under the AANG Base, and if so, to determine the extent of the contamination. Investigations have shown that contamination is present in soils and ground water at the Base.

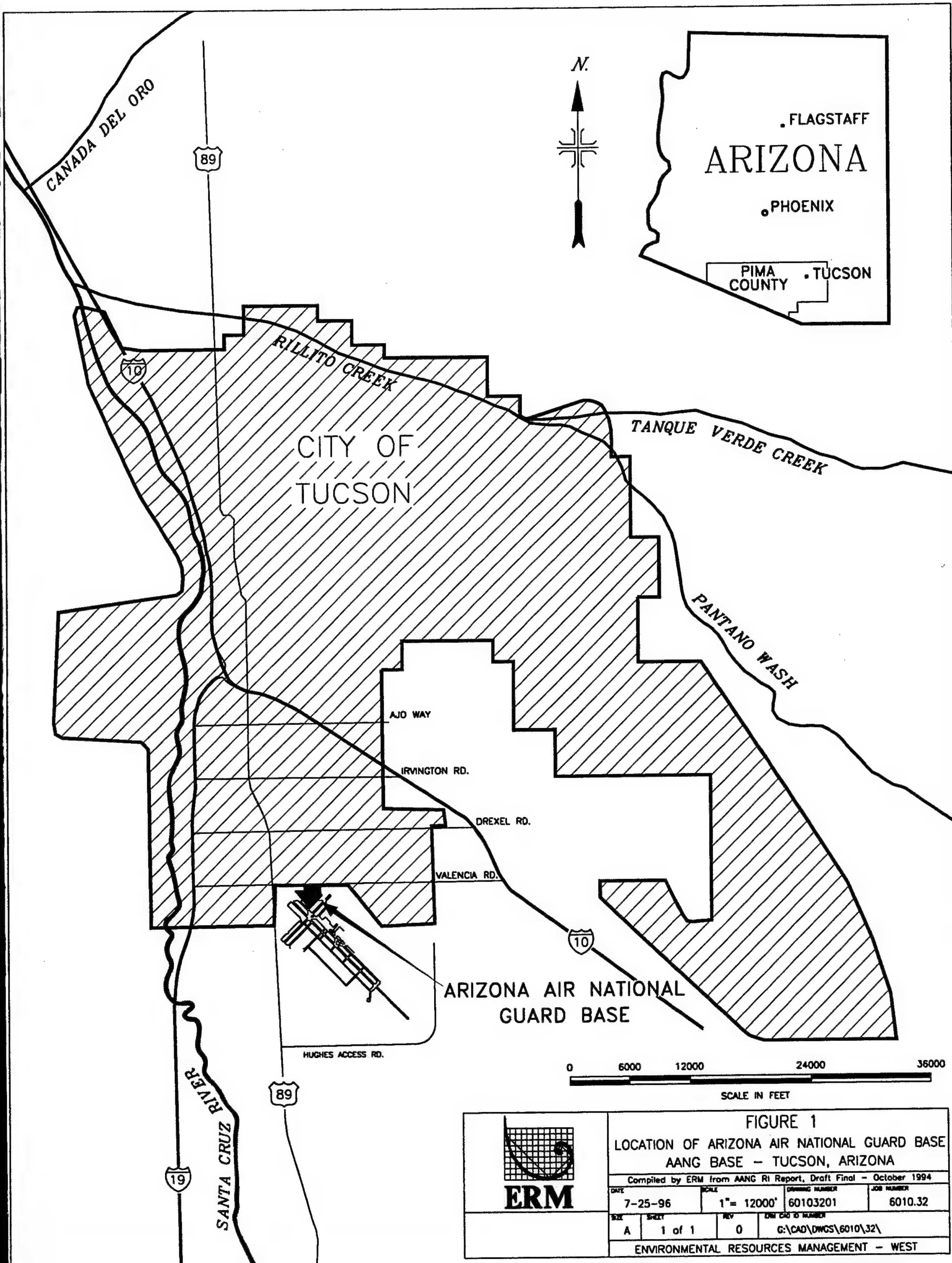


FIGURE 1
LOCATION OF ARIZONA AIR NATIONAL GUARD BASE
AANG BASE – TUCSON, ARIZONA

A Remedial Investigation (RI) was performed to determine the nature and extent of potential soil contamination at eight historic areas of concern (Figure 2). The RI was completed and published by NGB in a report dated June 1995. The eight sites were as follows:

- Site 1 - Old fire-training area (south of Building 49);
- Site 2 - Solvent-dumping area, east fence line (east of Building 49 along Airport Wash);
- Site 3 - Storm drain discharge point, gatehouse (north of the Gatehouse);
- Site 4 - AANG Base parking lot, west (east of Building 48);
- Site 5 - Old wash rack area (east end of Building 33);
- Site 6 - Solvent-dumping area (east of Building 41);
- Site 7 - Edges of aircraft parking apron (north, east, and south edges of main aircraft parking apron); and
- Site 8 - Petroleum, Oil, and Lubricants area (fenced area north of Building 27).

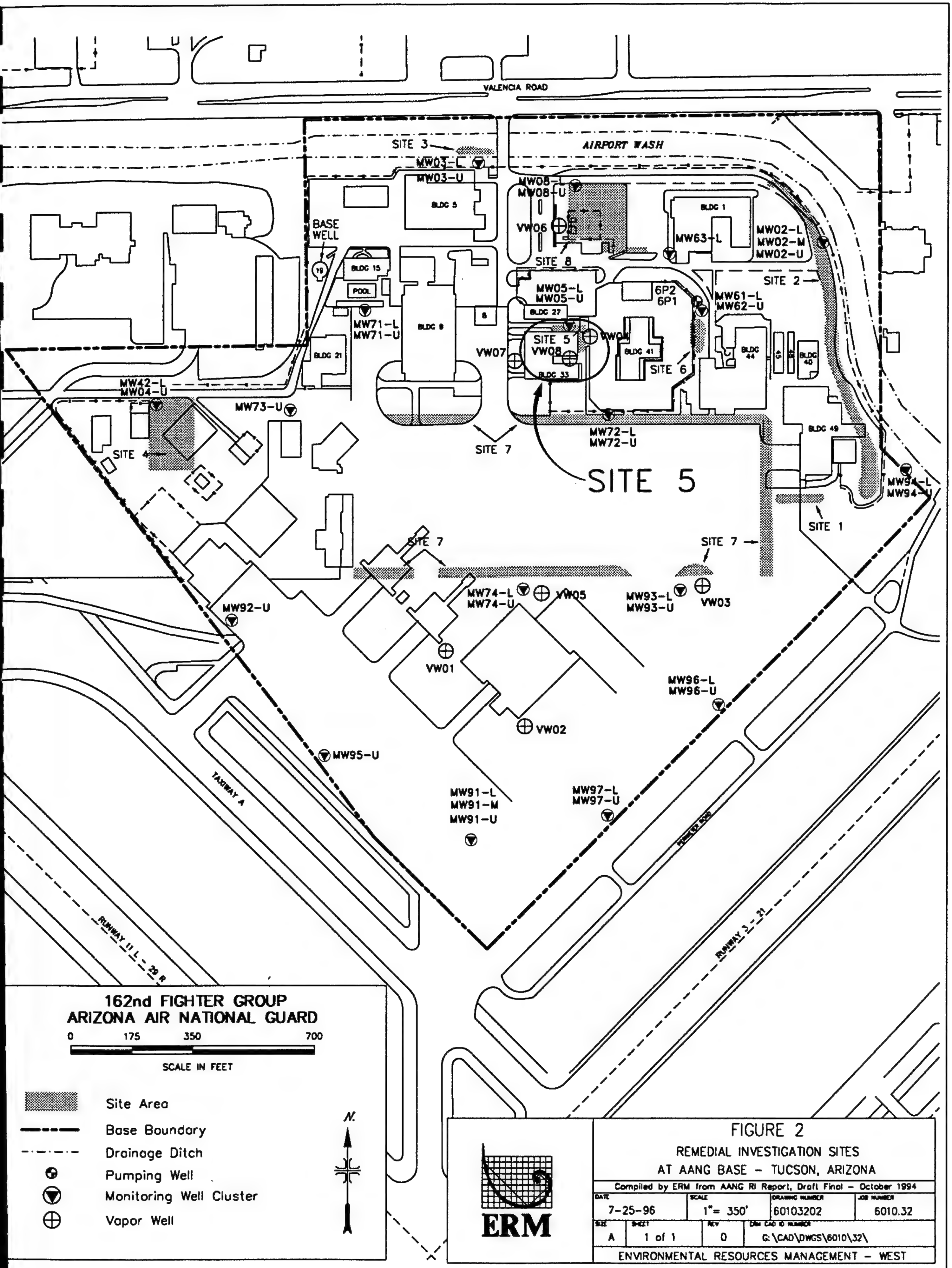
A Risk Assessment, included in the RI Report, evaluated the potential risk to human health and the environment posed by soil contaminants at each area of concern. The RI and the risk assessment were key to identifying sites requiring cleanup. Of the sites evaluated, only Site 5 was identified as requiring soil cleanup. The remaining sites were identified as requiring no further action.

A Feasibility Study (FS) was prepared following completion of the RI. The FS evaluated potential cleanup technologies for contaminated soil and was completed by NGB in November 1995.

A Remedial Design for cleanup of ground water containing TCE was completed for the AANG Base in February 1996. The Remedial Design for ground water has proceeded in parallel with the FS for soils.

Site History

In the Final RI Report, one area of soil contamination was identified that requires cleanup based on a potential threat to ground water. The site is called "Site 5 - Old Wash Rack Area."



VALENCIA ROAD
AIRPORT WASH
SITE 3
MW03-L
MW03-U
BLDG 5
BASE WELL
19
BLDG 15
POOL
MW71-L
MW71-U
BLDG 9
BLDG 21
8
MW08-L
MW08-U
VW06
SITE 8
BLDG 1
MW63-L
MW02-L
MW02-M
MW02-U
SITE 2
MW05-L
MW05-U
BLDG 27
6P2
6P1
MW61-L
MW62-U
SITE 5
VW08
VW04
VW07
BLDG 33
BLDG 41
SITE 6
BLDG 44
45
BLDG 40
MW42-L
MW04-U
MW73-U
SITE 4
SITE 7
MW72-L
MW72-U
BLDG 49
SITE 5
MW94-L
MW94-U
SITE 1
SITE 7
SITE 7
MW74-L
MW74-U
VW05
MW93-L
MW93-U
VW03
MW92-U
VW01
MW96-L
MW96-U
VW02
MW95-U
TAXIWAY A
MW91-L
MW91-M
MW91-U
MW97-L
MW97-U
RUNWAY 11 L - 29 R
RUNWAY 3 - 21
162nd FIGHTER GROUP
ARIZONA AIR NATIONAL GUARD
0
175
350
700
SCALE IN FEET
Site Area
Base Boundary
Drainage Ditch
Pumping Well
Monitoring Well Cluster
Vapor Well
N.
ERM
FIGURE 2
REMEDIAL INVESTIGATION SITES
AT AANG BASE - TUCSON, ARIZONA
Compiled by ERM from AANG RI Report, Draft Final - October 1994
DATE 7-25-96
SCALE 1"= 350'
DRAWING NUMBER 60103202
JOB NUMBER 6010.32
SIZE A
SHEET 1 of 1
REV 0
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ENVIRONMENTAL RESOURCES MANAGEMENT - WEST

Site Description

Site 5 - Old Wash Rack Area consists of a 10-foot-wide strip along the northern and eastern sides of Building 33 (Figure 3). Underneath the eastern strip lies an oil/water separator and sanitary sewer line that connects with the older sanitary sewer line running parallel to the northern side of Building 33. The old wash rack area is now covered by the northeast corner of Building 33. The site is currently covered by pavement and is used for storage of surplus equipment from the munitions group.

Site History

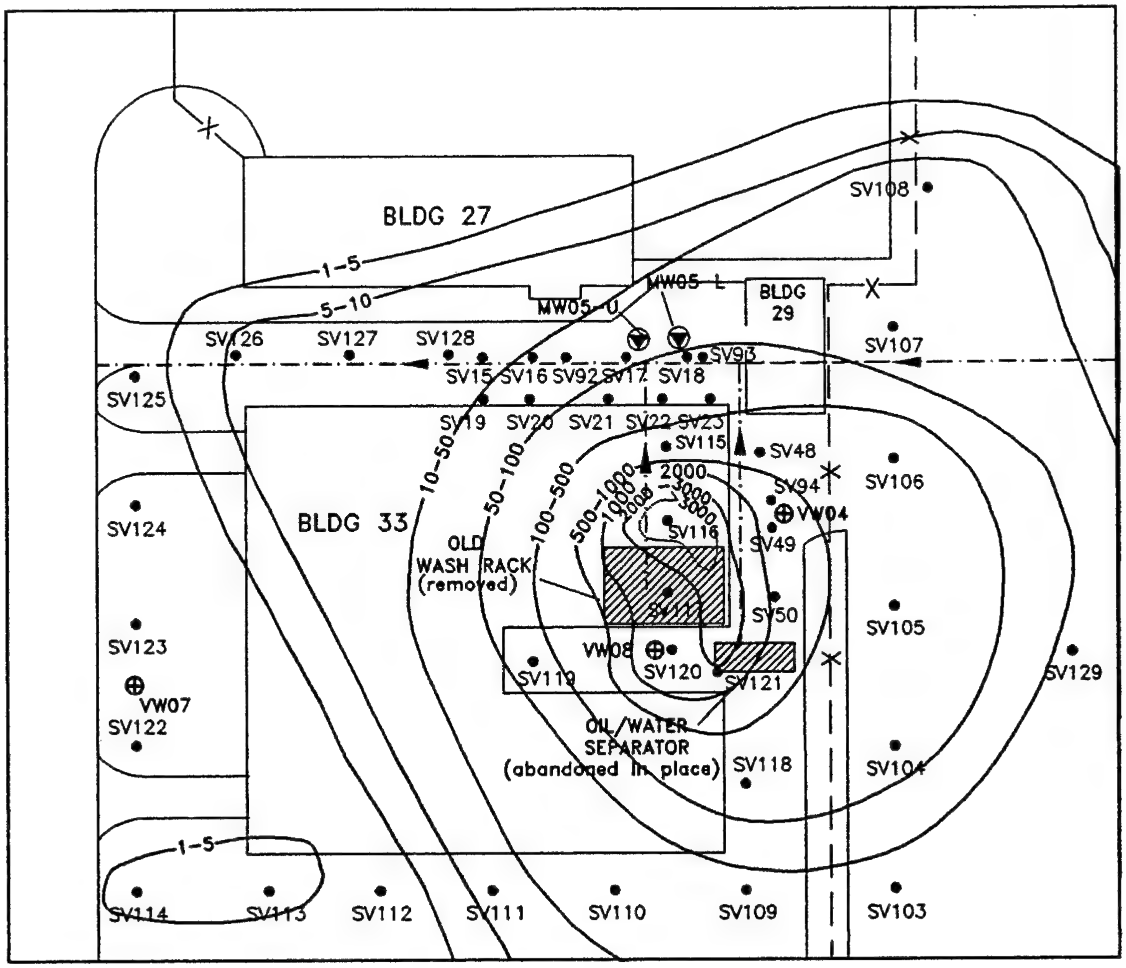
Site 5 served as a wash rack area for the engine shop and aircraft maintenance shops from 1959 to 1985. The old wash rack area has reportedly always been connected to the sanitary sewer. In 1980, the wash rack drain was connected to an oil/water separator that also discharges to the sanitary sewer system. Use of the oil/water separator was discontinued in 1985. Results of interviews at the Base suggested that leaks from the sanitary sewer network and drainage into the old wash rack are potential contaminant pathways to the surrounding soil. Possible contaminants at this site were identified as PD-680 solvent, TCE, tetrachloroethylene (PCE), and oils. An estimated 3,000 gallons of waste solvent (primarily TCE but PCE may also have been used) were disposed of in the former wash rack drain.

Lead Agency

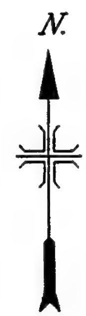
The NGB is the lead agency for site activities. The NGB is a joint-staff bureau of the United States Departments of the Army and the Air Force. The Air National Guard Readiness Center is the NGB's representative for coordinating environmental investigations at the AANG Base. Both EPA, the Arizona Department of Environmental Quality (ADEQ), and Arizona Department of Water Resources are support agencies for site activities.

Highlights of Community Participation

The RI Report, FS Report, and Proposed Plan for Cleanup of Soil Contamination were released to the public in June 1995, November 1995, and January 1996, respectively. These documents, in addition to others relevant to environmental investigations at the AANG Base, were made available to the public in the Information



SITE 5
162nd FIGHTER GROUP
ARIZONA AIR NATIONAL GUARD



LEGEND

MW05-U	MONITORING WELL LOCATION
VW07	IN-SERVICE VAPOR WELL LOCATION
SV110	SOIL VAPOR SAMPLE LOCATION
-·-·-·-·-	SANITARY SEWER
>3000	ISOCONCENTRATION CONTOUR FOR TCE IN SHALLOW SOIL VAPOR ($\mu g/L$)

0 30 60 120 180

SCALE IN FEET

ERM	FIGURE 3 DISTRIBUTION OF TCE IN SHALLOW SOIL VAPOR AT SITE 5			
	Compiled by ERM from AANG RI Report, Draft Final – October 1994			
	DATE 1-04-95	SCALE 1" = 60'	DRAWING NUMBER A-6003.21-02	JOB NUMBER 6019.21
	SIZE A	SHEET 1 of 1	REV 0	ERM CAD ID NUMBER G:\CAD\TEMP\SHARON\TUCSON\60032102
THESE DOCUMENTS AND INFORMATION CONTAINED HEREIN ARE THE EXCLUSIVE PROPERTY OF ERM-WEST AND ARE NOT TO BE REPRODUCED OR USED FOR ANY PURPOSE WITHOUT WRITTEN APPROVAL FROM ERM-WEST	ENVIRONMENTAL RESOURCES MANAGEMENT – WEST			

Repository/Administrative Record file available at the TCE Superfund Library, El Pueblo Neighborhood Center, 101 West Irvington Road, Tucson, Arizona.

Notice of availability of the Proposed Plan was published in the *Arizona Daily Star* on January 8, 1996. Approximately 275 copies of a factsheet describing the Proposed Plan were mailed on January 8, 1996. Additional copies of the factsheet were provided upon request by the Base Environmental Coordinator.

A public comment period for the Proposed Plan was held from January 8 to April 8, 1996. In addition, a public meeting was held on February 22, 1996. At this meeting, representatives from NGB, EPA, and ADEQ answered questions about the contamination at Site 5 and the remedial alternatives under consideration.

Presentations about the Proposed Plan for Soils and NGB's preferred remedial alternative were given to the Unified Community Advisory Board (UCAB). The purpose of UCAB is to be a focal point for the exchange of information between parties performing investigations or cleanup actions at the Tucson Airport Area Superfund Site and the local community. Presentations were made during the January 17 and March 20, 1996, UCAB meetings.

A response to the formal comments received during this period is included in the Responsiveness Summary, which is part of this Record of Decision. This decision document presents the selected remedial action for soils at Site 5 at the AANG Base, Tucson, Arizona, chosen in accordance with Comprehensive, Environmental Response, Compensation, and Liability Act (CERCLA), as amended by Superfund Amendments and Reauthorization Act (SARA) and, to the extent practicable, the National Contingency Plan (NCP). The decision for this site is based on the administrative record for this site.

Scope and Role of the Response Action

The response action that is the subject of this decision document is the soils remedy for an area of known TCE [and other volatile organic compounds (VOCs)] soil contamination at the AANG Base. Implementation of the soils remedy will result in the reduction of transport of TCE and other VOCs from AANG Base soils to ground water to levels protective of human health and the environment. As discussed in the Site Background section, NGB has designed a remediation system for cleanup of TCE in ground water at the AANG

Base. Together, the soil and ground water remedies constitute the overall remedial strategy for the AANG Base. This strategy is necessary to restore the underlying aquifer to drinking water quality.

Site Characteristics

Characteristics of Site 5 are described below.

Surface Water Hydrology

Due to the flat topography, surface runoff at Site 5 occurs predominantly as sheet flow. Runoff flows to the north, where it is intercepted by one of several storm drain catch basins north and east of Building 27.

Geology

Site 5 surface soils have been altered by construction, making identification difficult. The subsurface soils consist of unsaturated sands and silty sands deposited in cyclic intervals. The vadose zone extends from ground surface to approximately 88 feet below ground surface (bgs) and consists of silty sands, caliche deposits of varying induration, and gravelly sands.

Underlying these sediments are two sand units, the upper and lower subunits of the upper regional aquifer. The upper subunit at Site 5 is composed of well graded, light-brown, gravelly, coarse sand. The upper subunit sand at Site 5 is coarser than upper subunit sand at other sites and is generally silt-free. The upper subunit at Site 5 is encountered at about 88 feet bgs.

The middle aquitard separates the upper and lower subunits and is composed of tight sandy silt with scattered pebbles. The middle aquitard at Site 5 is encountered at 103 feet bgs. Caliche cementation is prevalent in the interval of 108 to 110 feet bgs of the middle aquitard. The lower subunit at Site 5 is encountered at 128 feet bgs and is underlain by the basal aquitard consisting of clayey silt. The basal aquitard, identified as the regional aquitard, is encountered at approximately 138 feet bgs.

Hydrogeology

The Tucson basin alluvial aquifer is divided into upper and lower regional units. The geology at the AANG Base can be divided into the following five distinct hydrostratigraphic units:

- Vadose zone;
- Upper subunit of the upper regional aquifer;
- Middle aquitard of the upper regional aquifer;
- Lower subunit of the upper regional aquifer; and
- Regional aquitard.

The upper and lower subunits of the upper regional aquifer are responsible for the majority of ground water transport at the AANG Base. The upper subunit is composed of well-graded, dominantly coarse-grained, saturated sand. The lower subunit is predominantly composed of coarse-grained, well graded sand. A distinctive feature of the lower subunit is the presence of a northwest-southeast trending sand channel that occurs along the southern and central portion of the AANG Base. The middle aquitard separates the upper and lower subunits. It is composed of sandy silt with varying amounts of caliche cementation and clay. A discontinuous middle subunit is present within the middle aquitard, in the eastern and southern portions of the AANG Base.

Both the upper and lower subunits underlie Site 5. The upper subunit is approximately 9 to 11 feet thick, which is greater than the average thickness of this unit at other locations at the AANG Base. The lower subunit is approximately 9 to 11 feet thick, about the average thickness of this unit at other locations at the AANG Base. Ground water flow directions in the upper and lower subunits trend to the northwest and depth to ground water is approximately 90 feet bgs.

Demographics and Land Use

Site 5 is in the north-central part of the AANG Base. The nearest residence lies approximately 500 feet north of the AANG Base's northern boundary along Valencia Road. Land use north of the AANG Base is a mixture of light industrial, commercial, and residential.

Ecology

The area encompassed by Site 5 is covered by asphalt, concrete, and pavement, with no natural vegetation or wildlife present.

Surface Features

The surface features at Site 5 consist of flat, paved surfaces surrounded by various buildings.

Nature and Extent of Contamination

TCE, PCE, 1,1,2-trichloroethane (1,1,2-TCA), 1,1,1-trichloroethane (1,1,1-TCA), and 1,2-dichloroethane (1,2-DCA) were detected in one or more soil or soil gas/vapor samples collected from sampling locations within Site 5. Review of the soil gas data indicates the following:

- Total VOC concentrations in soil vapors are generally greater in shallow soils (less than 10 feet bgs) than in soil vapor samples collected throughout the rest of the vadose zone.
- The highest VOC concentrations in deeper (below 10 feet bgs) soil vapor samples were detected in vapor monitoring well VW04. Soil vapor concentrations at the deepest interval monitored, approximately 84 feet bgs, averaged approximately 1,000 micrograms per liter (μg/l) in air.
- The vertical distribution of VOC concentrations in the vadose zone is highly variable within Site 5.

Figure 3 presents an isoconcentration contour map for TCE in soil vapors at Site 5.

Fate and Transport of TCE and Other VOCs

The RI Report included a review of scientific literature for the environmental fate of TCE, PCE, and 1,1,1-TCA in soil and ground water. The results of the review were compared to the data collected during the RI. The results of this comparison indicated that the three VOCs are not being actively biodegraded in either soil or ground water at the AANG Base.

The potential route of exposure to a receptor from contamination at Site 5 is by migration through the vadose zone to ground water of the

upper and lower subunits or by vapor emissions to the ground surface and into the indoor air of adjacent buildings.

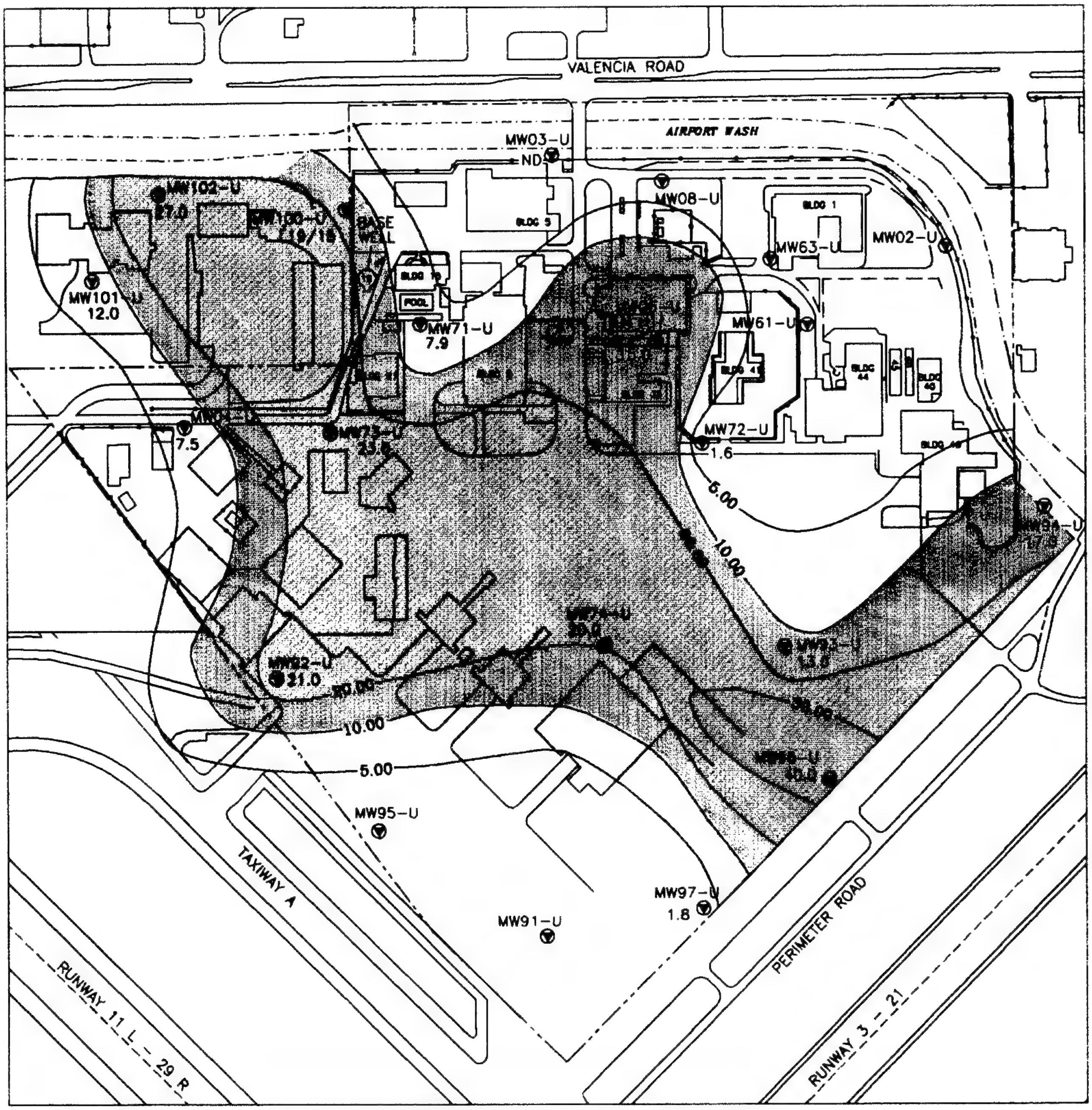
The RI Report concluded that vadose zone transport of TCE could be responsible for contributing to low concentrations of TCE in ground water of the upper subunit. The TCE concentration gradient in ground water of the upper subunit indicates that a contaminant plume is likely to be migrating through and downgradient of Site 5 (Figure 4). The presence of other VOCs were determined to provide an insignificant impact to upper subunit ground water. The absence of any TCE-related degradation compounds in ground water suggests that the only factor affecting the migration of TCE is ground water movement.

Summary of Site Risks

None of the contaminant levels found in soil exceed the EPA's proposed action levels in soil (40 Code of Federal Regulations Part 264 Subpart S as included in Federal Register 55(145):30865-30867, Appendix A) or ADEQ's Health Based Guidance Levels (HBGLs) as prescribed in Arizona Revised Statutes Title 49-152. The respective proposed action levels and HBGLs for PCE, TCE, 1,2-DCA, 1,1,2-TCA, and 1,1,1-TCA are well above the concentrations of these compounds detected at this site (Appendix A). Consequently, there are no significant carcinogenic or noncarcinogenic health risks from direct exposure to soil at Site 5 (e.g., exposure to surface soils).

Transport of VOCs from subsurface soils to ground water presents a potential source of health risk associated with Site 5. Observed contamination in ground water of the upper and lower subunits exceeds the EPA's ground water cleanup goal for TCE of 5 μg/l and may present a potential risk to the public and environment. EPA has adopted a policy with regards to soil remediation in the TIAA Superfund site that requires each contaminant to be removed from soils until an Allowable Residual Contamination Concentration (ARCC) is achieved. The ARCC is defined as the concentration of a contaminant that will not cause or contribute to ground water contamination in excess of site ground water cleanup goals.

The ARCC for Site 5 was determined during the FS using the VLEACH/mixing cell method. The evaluation was performed using simplifying assumptions regarding the areal and vertical extent of TCE and other VOCs in soil. The results of the evaluation indicated that the preliminary ARCC for TCE in soil vapors at Site 5 is approximately 200 μg/l. This ARCC estimate represents an overall average TCE



EXPLANATION

—10.00— ISOCONCENTRATION CONTOUR INTERVAL = 5 MICROGRAMS PER LITER

— - - - BASE BOUNDARY

- - · - · - DRAINAGE DITCH

MONITORING WELL LOCATION

1.6 TCE CONCENTRATION IN MICROGRAMS PER LITER

ND NONE DETECTED

0 400 800

FEET

FIGURE 4 C:\TUANG\9628\9628F03	TCE PLUME IN THE UPPER SUBUNIT OF THE UPPER REGIONAL AQUIFER (DECEMBER 1995)	ERM 14 MARCH 1996

concentration in the vadose zone at Site 5. The maximum TCE concentrations in shallow and deep soil vapor samples collected during the RI were approximately 3,000 and 1,800 μg/l, respectively. The analysis also indicated that other VOCs detected in Site 5 soil vapor do not pose a risk to ground water.

Description of Alternatives

NGB used a new EPA-approved process to develop, screen, and evaluate soil cleanup methods as part of the FS. This process, called the "Presumptive Remedy", is designed to streamline the selection of cleanup methods based on EPA's experiences in administering the Superfund program. The presumptive remedy method and remedial alternatives developed using this method are described in the following sections.

Presumptive Remedy Approach

Description

EPA has studied various technologies applied at CERCLA sites with VOC contamination in soils as part of its effort to streamline the FS process. This evaluation consisted of an analysis of the technical literature and review of the results of the remedy selection process from FSs and Records of Decisions (RODs). The purpose of the evaluation was to formulate general conclusions about the application of these technologies at sites with VOC contamination in soils. The evaluation is summarized in EPA's report entitled *Feasibility Study Analysis For CERCLA Sites with Volatile Organic Compounds in Soils* (August 1994). The evaluation concluded that certain technologies were routinely screened out during the FS process based on the lack of effectiveness, difficulty to implement, or excessive costs. The evaluation also concluded that three remedies [soil vapor extraction (SVE), thermal desorption, and incineration] were frequently selected to address VOC contamination in soils at CERCLA sites. Based on its evaluation, EPA determined that several treatment technologies could be eliminated from consideration during the FS process at sites where the presumptive remedy of SVE, thermal desorption, or incineration would be appropriate. Furthermore, EPA recommended that its August 1994 report could be used as a reference in an FS when the technology identification and screening steps are abbreviated or eliminated when adopting the presumptive remedy approach.

Applicability

Various site- and contaminant-specific factors were reviewed to evaluate the applicability of SVE to remediation of Site 5 soils. In preparing the FS Report, the results of case studies for similar sites both in the TIAA Superfund Site and throughout the country were reviewed. The results of the technology screening analysis suggests that the types of contaminants present, distribution of contaminants, and soil physical parameters are amenable to remediation using SVE. In accordance with the EPA's guidance document entitled Presumptive *Remedies: Site Characterization and Technology Selection for CERCLA Sites with Volatile Organic Compounds in Soils* (EPA Directive 9355.0-48FS), only SVE was further evaluated.

Remedial Alternatives

Once SVE was determined to be an appropriate the cleanup method for Site 5 soils, NGB evaluated alternative ways that the cleanup method might be implemented. SVE commonly consists of one or more extraction wells placed in the contaminated soil zone. A consistent vacuum is pulled on the wells in order to remove VOC vapors from the soils. Once the soil vapor containing VOCs is removed, then a decision must be made whether to discharge the compounds in the extracted soil vapor to the air or if VOCs should be captured (or treated). NGB evaluated three basic options for using SVE as a cleanup method for Site 5 soils:

- SVE with Catalytic Oxidation Treatment of Offgases;
- SVE with Activated Carbon Treatment of Offgases;
- SVE with No Treatment of the Offgases.

The No Action alternative was also evaluated.

Except for the No Action alternative, all three SVE alternatives share a number of common elements, such as installing one or more soil vapor extraction wells, air/water separators, vacuum pumps, and emission stacks. These elements are shown in Figure 5.

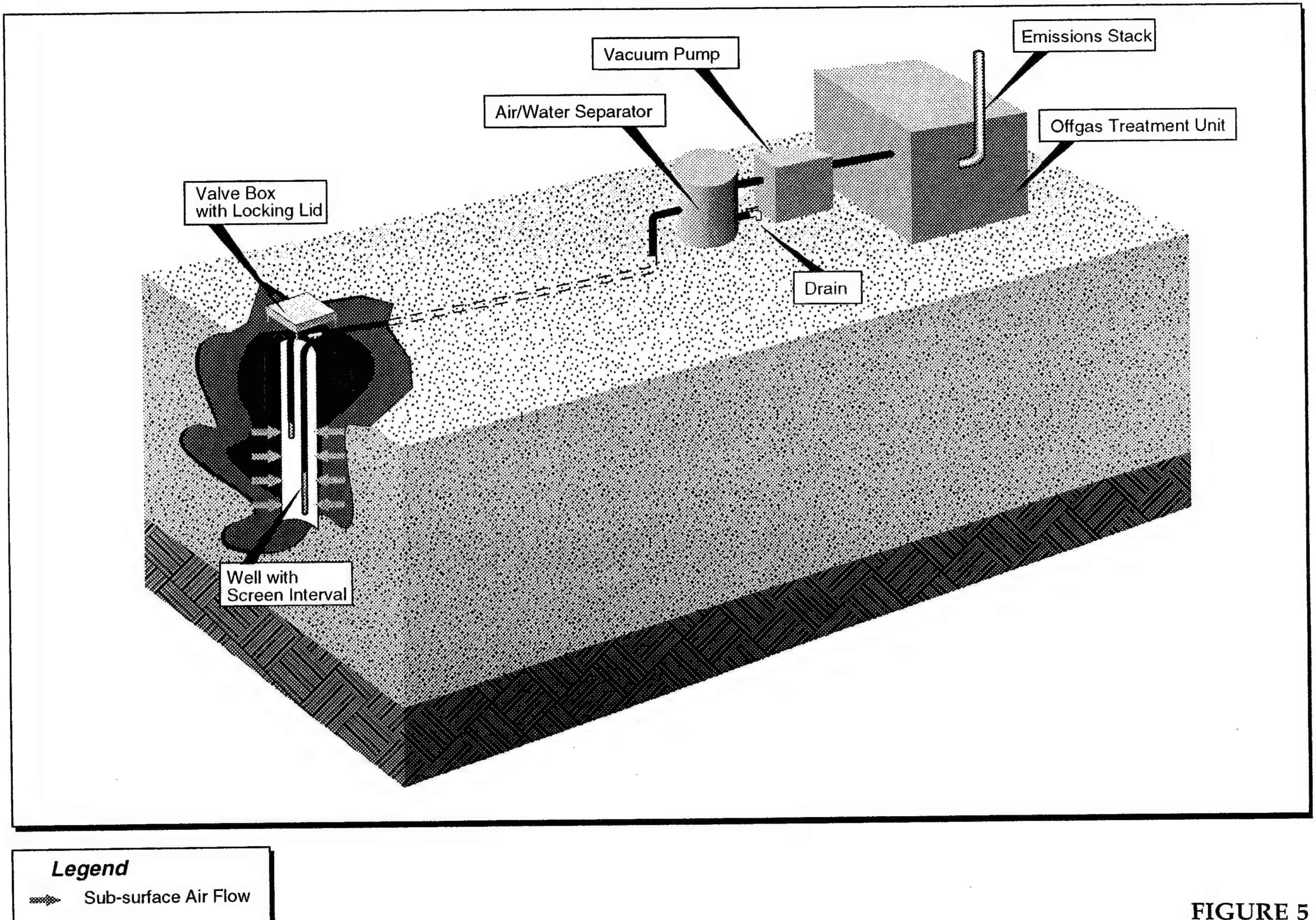


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FIGURE 5

Typical Soil Vapor Extraction System

Summary of Comparative Analysis of Alternatives

This section of the ROD identifies and summarizes the relative performance of each soil remedial alternative with respect to nine criteria.

Compliance with Applicable or Relevant and Appropriate Requirements (ARARs)

Applicable or Relevant and Appropriate Requirements (ARARs) applicable to Site 5 soils are included in Appendix A. All of the SVE alternatives with treatment of offgases will comply with state and federal ARARs. The SVE with No Treatment of Offgases alternative may not meet Pima County Air VOC emission standards. The remaining SVE alternatives will comply with Pima County air emission standards.

Long-Term Effectiveness and Permanence

All three SVE alternatives are expected to be equally effective in permanently reducing the inherent risk to ground water posed by TCE and other VOCs in Site 5 soils.

Reduction of Toxicity, Mobility, or Volume of Contaminants through Treatment

Of the SVE alternatives, SVE with No Treatment of Offgases provides the least reduction of toxicity, mobility, or volume. Of the remaining two SVE alternatives, SVE with Catalytic Oxidation treatment of Offgases would be expected to be more effective in reducing toxicity mobility or volume of contaminants than SVE with Activated Carbon Treatment of Offgases.

Short-Term Effectiveness

All three SVE alternatives are expected to be equally effective in reducing TCE and other VOCs concentrations in Site 5 soils within a short time frame (less than 5 years). Results of recent testing at Site 5 indicates that the selected remedial alternative may achieve soil cleanup levels during 1 year or less.

Implementability

All three SVE alternatives are technically feasible and can be implemented using readily available equipment and technologies.

Costs

The highest cost alternative is SVE with Catalytic Oxidation Treatment of Offgases at $1,087,000. SVE with Activated Carbon Treatment of Offgases is estimated at $1,047,000. The lowest cost alternative is SVE with No Treatment of Offgases at $648,000. These costs were based on the assumption that each alternative would be operated for 5 years.

Regulatory Acceptance

The State of Arizona and EPA, Region IX support the preferred remedial alternative of SVE with Activated Carbon Treatment of Offgases.

Community Acceptance

NGB's feedback from community members during the public meeting and the comment period indicated a preference for the SVE remedial alternative. The community also expressed a preference for the use of the Activated Carbon Treatment of offgases. The primary area of community concern was the proposed cleanup level.

Selected Remedy

The selected remedy for Site 5 soils is SVE with Activated Carbon Treatment of Offgases. This alternative was selected based on NGB's detailed analysis of the remedy against the nine criteria set forth in CERCLA Section 121. SVE with Activated Carbon is also acceptable to the community members.

The cleanup level for TCE and other VOCs detected in soil vapor is set to reduce the impact of these compounds to less than Maximum Contaminant Levels (MCLs; established under the Safe Drinking Water Act) in the upper subunit of the upper regional aquifer. The cleanup level is selected for protection of ground water. The cleanup level is determined by using the most recent EPA-approved version of the

VLEACH/mixing cell model to demonstrate that the impact of residual soil vapor concentrations on ground water is below MCLs.

Pilot-scale tests of SVE with Activated Carbon have been performed at Site 5 during the public comment period for the Proposed Plan. Based on the pilot testing data, NGB anticipates that the cleanup level can be achieved in 1 year or less after implementing the selected remedy.

Statutory Determinations

In accordance with CERCLA Section 121, the remedy selected by the lead agency, in consultation with the support agency, must:

- Be protective of human health and the environment;
- Comply with ARARs;
- Be cost-effective;
- Utilize permanent solutions and alternative treatment technologies or resource recoveries to the maximum extent practicable; and
- Satisfy the preference for treatment that reduces toxicity, mobility, or volume as a principal element.

The following sections briefly summarize the evaluation of the selected remedy with respect to these factors.

Protection of Human Health and the Environment

The selected remedy is protective of human health and the environment with respect to TCE and other VOCs in the vadose zone. At Site 5, the principal risk to human health is through transport of TCE to ground water. The selected remedy will remove TCE from Site 5 soils such that the soils could not cause the ground water to be contaminated above health-based levels. The remedy will also serve to reduce concentrations other VOCs present in soils.

Compliance with ARARs

Appendix A identifies the ARARs for the AANG Base. The selected remedy will comply with all ARARs identified in Appendix A.

Cost-Effectiveness

The remedial action selected in this remedy is cost-effective. Typically, much more time and money is required to remove TCE and other VOCs from ground water using pump and treat methods than to remove it from soils using the SVE method. Therefore, the money spent on soil remediation activities will, in turn, reduce costs for ground water cleanup.

Utilization of Permanent Solutions and Alternative Treatment Technologies

The remedy selected by this ROD utilizes permanent solutions and alternative technologies or resource recovery technologies to the maximum extent practicable. NGB has determined that the selected SVE alternative provides long-term effectiveness and permanence; reduction in toxicity, mobility, and volume of contaminants through treatment; short-term effectiveness; implementability; and cost-effectiveness, considering both state and community acceptance.

Preference for Treatment as a Principal Element

The SVE system selected in this remedy removes VOCs from the soil followed by emissions treatment. The system operation satisfies the statutory preference for the use of remedies that includes treatment as a principal element.

SECTION III

RESPONSIVENESS SUMMARY

The purpose of the Responsiveness Summary is to summarize NGB's response to the comments received from the public on the preferred soil cleanup alternative for soils at Site 5.

NGB provided a public review and comment period on its Proposed Plan and FS for Site 5 Soils. This period was from January 8 to March 8, 1996. In response to public request, NGB extended the public comment period to April 8, 1996.

Public Comments

NGB has provided an opportunity for the public to comment in two ways: 1) formal oral and written comments at NGB's public meeting; and 2) formal written comments received during the public comment period. NGB has also attempted to respond immediately to informal questions and comments received over the course of the project.

Each individual commentor has been assigned a letter identifier in order to protect their privacy.

Oral Comments at the Public Meeting

On February 22, 1996, NGB held a public meeting at the El Pueblo Neighborhood Center in Tucson, Arizona. During the meeting, NGB presented a summary of the proposed plan and details regarding the proposed cleanup technology. The format for the meeting included:

- Informal public display and presentation;
- Formal presentation of the proposed plan;
- Question and answer session; and
- Formal public comment period.

The proceedings of the meeting were recorded and a transcript was prepared for the question and answer session and formal public

comment period. A transcript of this portion of the meeting will become part of the Administrative Record for the AANG Base. At the meeting, NGB attempted to respond to all questions during the question and answer session. Although comment cards and pens were provided at the comment period, none of the attendees provided written comments during the meeting.

The following are selected comments and questions that were answered by NGB during the public meeting on February 22, 1996. The transcript is available for those who wish to review all of the oral questions and answers from the meeting. The following section provides index numbers that reference the location of the question or comment on the meeting tape recording.

Index No. 142

Commentor A wanted to know what the current impact of Site 5 soil was on ground water.

NGB Response. Site 5 soils currently impact ground water at approximately 5 to 10 μg/l above the background level of TCE that is currently migrating through the AANG Base.

Index No. 151 Through 187

Commentor B and Commentor C wanted to know more detail regarding NGB's data collection activities at Site 5. Specifically, were core samples collected, vadose wells installed, vapor samples collected and analyzed?

NGB Response: Core samples, vadose zone monitoring wells, and vapor samples were collected during the RI. NGB currently has four vapor monitoring well clusters at Site 5. Each cluster contains five individual monitoring wells where vapor samples can be collected from different depths up to 90 feet. These monitoring wells will be used in the future to see how the SVE cleanup has progressed.

Index No. 196

Commentor B asked how much TCE can really be removed from the soil when soil vapors are extracted from Site 5 soils.

NGB Response. NGB hopes to remove enough TCE from soils to achieve the cleanup goal so that the soils will not present a problem to ground water. The only way we will really know how much can be removed is to start the remediation system and collect samples from the vapor monitoring well clusters.

Index No. 272 To 280

Commentors B, C, and D asked for information regarding disposal of spent activated carbon that is associated with operation of the recommended SVE system. Specifically, where would the carbon be transported, burned or recycled, or it be a hazard in the future.

NGB Response. The spent carbon will be removed to an off-site location. This location has not yet been selected and will be determined later during the engineering design phase that follows the ROD. There are several sites in the western United States for carbon disposal, including at least one site in Arizona.

The carbon is essentially burned so that the carbon is raised to a high temperature. During this process, TCE and other VOCs are removed and destroyed. This process is called "carbon regeneration." Companies that provide regeneration services have safe-guards and controls to ensure that TCE will not impact human health or the environment during their process.

Index No. 335

Commentor C expressed concern that it appeared that few members of the community were involved in the public hearing and wished to know how many public notices were mailed to concerned citizens.

NGB Response. NGB mailed out and handed out approximately 275 copies of the Proposed Plan Factsheet. Additionally, a public notice was advertised in the *Arizona Daily Star*.

Index No. 514

Commentor A was interested in knowing what the minimum cleanup level would be for Site 5 soils and how the cleanup level was determined.

NGB Response. The cleanup standard and method of determining when the remediation will be completed will be established in the ROD. A cleanup level of 200 µg/l was determined prior to the start of remediation activities. The actual determination as to when the SVE system can be deactivated will be based on actual data collected from the SVE extraction and monitoring wells and based on an analysis using the VLEACH computer model. The cleanup level for soils was determined to protect ground water so that the maximum contaminant level of 5 µg/l for TCE was not exceeded due to migration of the compound from Site 5 soils.

Index No. 542 And 867 Through 038 (Tape 2)

Commentor A indicated having grave concerns regarding the selection of the 200 µg/l cleanup level. He felt the 200 µg/l was an arbitrary cleanup standard. He felt that it was improper for government agencies to try to tie the soil and ground water cleanup goals together. He also felt that it would be improper to stop the soil cleanup just to achieve a set level of protectiveness for ground water. He was also concerned that it appeared from the VLEACH modeling that Site 5 soils will have an impact to ground water for at least 100 years in the future.

Commentor A indicated that the best technologies should be used to achieve the maximum level of cleanup of soils. He said that he was not asking for a cleanup to 0 µg/l, but needed more information to see how the cleanup goal has been selected. He indicated that he understood that the federal drinking water standard set by EPA for ground water is 5 µg/l, but he did not believe that NGB should stop the soil gas cleanup just to meet that level. He expressed an interest in receiving additional information before the closing of the comment period so that we have time to study this information. The information he wished to receive was the following:

- How long it would take to run this SVE to achieve a 1 µg/l cleanup level for soils;
- What the final impact would be on ground water if a 1 µg/l cleanup level was achieved; and
- How much more expensive would it be to achieve a 1 µg/l versus a 200 µg/l cleanup goal.

He also said that he may wish to ask for an extension of the comment period.

NGB Response. NGB requested that any person wishing for an extension of the comment period provide a formal written request to Carol Kenny, Base Environmental Coordinator (see following section).

The 200 µg/l cleanup level was not arbitrarily defined. It was developed based on the modeling of the impact of Site 5 soils on ground water. NGB indicated that it would not be possible to provide the commentor with the information during the public meeting. However, this information could be provided at a later date after additional analyses were performed. Appendix B contains a formal written response to the commentor's questions.

Index No. 638

Commentor B asked how the humidity would be controlled so that water would not be introduced into the activated carbon vessel during operation of the SVE system.

NGB Response. NGB does not anticipate problems in keeping the relative humidity in the vapors to a low level. A heater will be used as well as a "knockout" drum to capture water from the vapors prior to flow into the carbon vessels.

Index No. 648 To 664

Commentor B was interested in knowing what contingencies have been planned by NGB if the SVE system does not work.

NGB Response. SVE is a proven technology that has been successfully used at many sites, including sites in the TIAA Superfund Site. NGB does not anticipate problems in successfully applying this technology to Site 5. A pilot test is planned for late March 1996 and more information will be collected at that time to project the actual performance of the technology at Site 5.

Index No. 728

Commentor C wanted to know how many NGB sites are being remediated throughout the country and if each site is different.

NGB Response. Approximately 280 sites are currently in remediation and each site differs by types of contaminants, nature of contamination, and size.

Index No. 783

Commentor B wanted to know why NGB has to use the 5 µg/l ground water cleanup standard when the TIAA Groundwater Remediation Project has to use a 1.5 µg/l standard.

NGB Response. EPA established the two cleanup goals for the TIAA Superfund Site. The lower standard was established for treated ground water for water that is put in the public water distribution system. The higher standard was established for ground water that is in the ground. This higher standard is the current Federal MCL established by EPA. The difference in the ground water standards is due to public comment during development of the ROD for ground water in the TIAA Superfund Site.

Index No. 123 (Tape 2)

Commentor C asked whether Dense Nonaqueous Phase Liquid (DNAPL) was present at the site and how it would be cleaned up.

NGB Response. Data collected at Site 5 indicates that DNAPL is not present; therefore, it does not present a problem.

Index No. 172 (Tape 2)

Commentor B asked if TCE in soils at Site 5 would ever be completely cleaned up from soil vapor.

NGB Response. It is not possible to completely remove every molecule of TCE from soils using current technology. A 100 percent cleanup cannot be achieved at the present time.

Written Comments

The written comments received during the comment period are detailed below.

Commentor D(February 26, 1996)

I feel the proposed treatability studies for the Vapor Gas Extraction of the TCE from soils at the AANG Base are the most practical at this time. In order to remove all TCE, all of the soil would have to be removed at a tremendous depth which not only would be expensive but impracticable health wise.

NGB Response. NGB concurs that it would be impractical to excavate and remove soils containing TCE from Site 5.

Commentor B (March 6, 1996)

Memorandum re: Extension of Public Comment Period to April 8, 1996

As per the above captioned subject, I am requesting an extension of the public comment period to April 8, 1996.

NGB Response. The public comment period was extended to April 8, 1996 in accordance with this comment.

Commentor A (March 7, 1996)

I want to thank Michael Grimm and the staff at the Air National Guard and Jim Quinn and the staff from ERM-West for allowing me to speak

and ask questions at your open meeting. In addition, my thanks go to Mr. Quinn and staff for working on the calculations required to answer my questions from the open meeting. I am very appreciative. Thank You!

Unfortunately, digesting all of the information and finalizing a comprehensive report before the closing deadline of March 8, 1996, has presented a great deal of frustration. I have found it impossible to complete my response, as the information was only presented to me on March 7, 1996. I am requesting a 30-day extension of the March 8, 1996, deadline for public comments on the proposed cleanup of soils at the Arizona Air National Guard Site.

<u>NGB Response.</u> The public comment period was extended to April 8, 1996, in accordance with this comment.

Commentor A (April 5, 1996)

I approve of most of the Proposed Plan for Cleanup of Soil Contamination as presented for the Air National Guard by ERM West at the February 22, 1996 Community Hearing. This includes the proposed technology for removal and disposal of the trichloroethylene (TCE) and associated VOC's at SITE 5 of the Tucson Air National Guard Site. One item, the suggestion to stop when the level of 200 ug/L (micro grams per liter) in soil vapor is attained, is of concern.

I differ in my concern for the level at which the cleanup of the soils will be considered complete. At present there is no standard for contaminants in the soil. TCE is a man-made substance, therefore it can not occur naturally in the soil or the water of the Tucson basin. The background level of TCE in the soil is zero. The preferred level of TCE for Tucson groundwater is there-fore zero. This includes TCE in the soil mass and the related vapor in the unsaturated zone. In addition the on-going water cleanup efforts at the other areas of the superfund site have proven that any TCE contaminant left to percolate from the soil into the groundwater will unnecessarily prolong the effective cleanup of the ground water.

If the cleanup can be done in 6 months to a 200 ug/L level as now estimated by ERM WEST, then, the ability of the technology will allow this cleanup to be achieved much faster that the five year estimate. This will leave some latitude to adjust for a longer operating time and still meet the reasonable cost of cleanup criteria. The best cleanup possible for the available technology is also of price importance. With these things in mind please let me advance a thought that is on my mind. It is my hope that the basis of this

suggestion can be used as a foundation and expanded on by the parties involved to find a way for continuing the cleanup to a 25 ug/L target in place of the 200 ug/L target.

Please read the following as I present the information in a manner to develop my thought.

Most the information is based on the data from the Air National Guard through ERM WEST and from EPA records.

1. Tucson is one of the few cities in the USA completely dependent on it's groundwater. It is our only resource for drinking water. The importance of achieving the best clean-up current technology is capable of is essential and even critical to the health and well-being of the citizens of Tucson.

2. Cleanup to 200 ug/L may be achievable in 2 to 6 months.

ERM WEST projects 2 to 6 months, at a cost much below the five year estimates, to achieve the 200 ug/L target level in the soil, this equates to removal of only about 75% of the estimated TCE <u>but leaves about 25% of the TCE in the soil</u>.

3. If the clean-up were to take the full five years you estimate the cost to be $1,047,000.

If it does take five years, then we are really talking about a bigger problem and the projection of item #2 can not be considered. If the six month estimate is valid then an adjustment of dollar allocation for continuing to operate should be reasonably anticipated and the more aggressive target of 25 ug/L is reasonable.

4. As data is studied from the pilot project and the other sites in this superfund area it can be seen that any contamination left in the soil will continue to effect the groundwater for unacceptable lengths of time.

The chart from ERM WEST (alternative 2) shows that at 250 ug/L the TCE will continue to percolate down to the water for more than our natural life times. Even after 100 years the TCE level in the groundwater will still be at 4.1 ug/L. This equates to a natural drop of only 0.7 ug/L in 100 years. If the calculations are correct this means it will require over 895 years for the groundwater to return to a natural state by itself.

The (alternative 7) shows that at 25 ug/L the groundwater contamination level would only be 0.6 ug/L after 100 years. A much preferred alternative if achievable at a reasonable cost.

Chart of cleanup goal alternatives

Soil Vapor Concentrations	Groundwater Concentrations 10 yrs	100 yrs
250 ug/L	4.8 ug/L	4.1 ug/L
25 ug/L	0.7 ug/L	0.6 ug/L

My though is: Find a way to let the technology do the best it possibly can.

Hopefully the pilot test results and projections are accurate and a formula can be defined to allow a more aggressive target for as long as cleanup/time/cost ratio is kept below a calculated slope/intersect line. For example, start by projecting the monthly cost of operating for, say, 24 months and developing a formula using operating cost per month also including the targets for 200 ug/L and 25 ug/L. This can be developed into a slope on a graph which will be useful for showing at what time the efforts will become unreasonable costly and should help to meet the concerns of your office and the community.

If this is not clear or if you have any questions please contact me.

NGB Response. Commentor A's letter refers to information included in ERM's letter of March 6, 1996 (Appendix B). This letter outlines ERM's best estimate of the additional costs and remediation time for Site 5 soils under several different cleanup level scenarios. As stated during the public meeting on the Proposed Plan for Soils, the cleanup level was established to be protective of ground water. The level of protectiveness adopted by NGB is based on the existing in-situ ground water cleanup level for the TIAA Superfund Site.

Although preliminary data collected at Site 5 suggests cleanup of TCE in soils may occur as soon as one year of SVE system operation, the actual time to cleanup could be longer. Accordingly, the actual operational costs (and the reasonableness of these costs within NGB's existing funding constraints) cannot be estimated at this time. It is possible that a lower overall concentration for TCE in soil vapor may actually be achieved during system operation. This lower concentration would provide a higher degree of protectiveness to ground water. However, it is not possible at this time to commit

government funds to achieve a higher level of ground water protection than is currently required by EPA for other Responsible Parties in the TIAA Superfund Site.

Community Preferences

NGB's review of the community comments (both written and verbal) indicates that the selected remedial action is acceptable. However, there is concern about the selection of the soil cleanup level for TCE.

Integration of Comments

NGB has noted the public comments and will ensure that the community is kept informed regarding the operation of the selected remedial action using the UCAB as a focal point. As indicated in NGB's response to the community's concern about the selected cleanup level (Appendix B), the application of highly stringent cleanup goals for TCE in Site 5 soils would provide no significant additional protection to ground water quality. NGB believes that the additional funds required to achieve a highly stringent cleanup goal would be better applied to remediate other contaminated sites outside of the AANG Base that pose a more significant risk to ground water quality. NGB believes that the majority of TCE in ground water under the AANG Base is coming from an upgradient source.

APPENDIX A

APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS

APPENDIX A

APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS

The Arizona Air National Guard (AANG) Base is located within the United States Environmental Protection Agency's (EPA's) Tucson International Airport Area (TIAA) Superfund site and is therefore included on the National Priorities List (NPL). Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Section 120 states that an installation included on the NPL is subject to all the legal requirements of CERCLA and the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). CERCLA requires that the remedial actions selected are protective of both human health and the environment, and that they comply with applicable or relevant and appropriate requirements (ARARs).

Definition of Applicable or Relevant and Appropriate Requirements (ARARs)

Applicable requirements are those cleanup standards, standards of control, and other substantive environmental protection requirements, criteria, or limitations promulgated under federal or state law that specifically address a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance at a CERCLA site.

Relevant and appropriate requirements are those cleanup standards, standards of control, and other substantive environmental protection requirements, criteria, or limitations promulgated under federal or state law that, while not specifically "applicable" to a hazardous substance, pollutant, contaminant, remedial action, location, or the circumstance at a CERCLA site, address problems or situations sufficiently similar to those encountered at the site that their application is well suited to evaluate site remedial actions. However, in some circumstances a requirement may be relevant, but not appropriate, for the site-specific situation.

In determining whether a requirement applies to the AANG Base, potential ARARs were initially screened for applicability. If

determined not to be applicable, the requirement was then reviewed for both relevance and appropriateness. Requirements that are determined to be relevant and appropriate command the same importance as applicable requirements.

In addition to ARARs, federal, state, and local criteria, advisories, or guidances that also may apply to the conditions found at the AANG Base were reviewed and are referred to as "to-be-considered" (TBC). TBCs are not legally binding; however, they are used within the context of the assessment and control site risks. ARARs and TBCs necessary for protection, must be attained for hazardous substances, pollutants, and contaminants on site.

Types of ARARs

ARARs that govern actions at CERCLA sites fall into the following three categories, based on site characteristics, chemicals present, and remedial alternatives:

- Chemical-specific ARARs are numerical values that represent a health- or risk-based standard or the results of methodologies used to determine an acceptable concentration of chemicals that may be found in or discharged to the environment. An example of a chemical-specific ARAR is a maximum contaminant level or air quality standard.
- Location-specific ARARs govern activities in certain environmentally sensitive areas. Examples are floodplains, wetlands, endangered species habitat, or historically significant resources.
- Action-specific ARARs are technology- or activity-based requirements or restrictions. Examples of action-specific ARARs include monitoring requirements, effluent discharge limitations, hazardous waste manifesting requirements, and occupation health and safety requirements.

ARARs

Chemical-, location-, and action-specific ARARs were reviewed and are presented in the following sections. All of the ARARs in this section are considered as "Draft" status. The Air National Guard has requested that the Arizona Department of Environmental Quality (ADEQ)

prepare a list of ARARs for this Record of Decision for Soils. The following sections include a list of ARARs provided by ADEQ and compiled based on ERM-West, Inc.'s, review.

Chemical-Specific ARARs

ERM reviewed potential federal, state, and local chemical-specific ARARs for soil. Table A-1 includes a summary of chemical-specific ARARs and TBCs.

Location-Specific ARARs

ERM reviewed potential federal, state, and local location-specific ARARs. Table A-2 includes a summary of location-specific ARARs and TBCs.

Action-Specific ARARs

ERM reviewed potential federal, state, and local action-specific ARARs. Table A-3 includes a summary of action-specific ARARs and TBCs.

TABLE A-1

Chemical-Specific Applicable or Relevant and Appropriate Requirements for Site 5 Soil

Compounds	HBGLs, Residential (mg/kg)	HBGLs Non-Residential (mg/kg)	EPA Subpart S Proposed Action Levels (mg/kg)	Maximum Concentration in Site 5 Soil (mg/kg)
TCE	120	504	60	0.25
PCE	27	113	10	0.025
1,1,1-TCA	11,000	38,500	7,200	0.13
1,1,2-TCA	24	84	120	0.008
1,2-DCA	15	63	8	0.0085

*Human Health-based Guidance Levels for the Ingestion of Contaminants in Soil, Arizona Department of Environmental Quality, June 1995 update as included in Appendix A to R18-7-205 (Arizona Administrative Code Title 18, Chapter 7, Article 2)

HBGLs = Human Health-Based Guidance Levels
mg/kg = milligrams per kilogram.
EPA = United States Environmental Protection Agency
TCE = Trichloroethylene
PCE = Tetrachloroethylene
1,1,1-TCA = 1,1,1-Trichloroethane
1,1,2-TCA = 1,1,2-Trichloroethane
1,2-DCA = 1,2-Dichloroethane

TABLE A-2

Location-Specific Applicable or Relevant and Appropriate Requirements for Site 5 Soil

Location	Citation	Requirement Description
Floodplain Areas	40 Code of Federal Regulations (CFR) 264.18 (b) and AAC R18-8-264	A Resource Conservation and Recovery Act facility located with a 100-year flood plan must be designed, constructed, operated, and maintained to prevent washout of any hazardous waste by a 100-year flood.
Area Where Action May Cause Irreparable Harm, Loss, or Destruction of Significant Artifacts	National Archaeological and Historical Preservation Act (16 USC § 469 and 470; 36 CFR Part 65)	Requires action to recover and preserve artifacts if the remedial action threatens significant scientific, prehistoric, historic, or archaeological data. Requires action to preserve historic properties/National Historic Landmarks.
Navigable Airspace	14 CFR 77	Requires notice of construction to be given to Federal Aviation Administration for construction of greater height extending outward and upward at a 100:1 slope for a horizontal distance of 20,000 feet from the nearest runway.
Endangered Species	16 USC § 1531	Remedial actions shall comply with requirements for endangered species in accordance with the Endangered Species Act.
Fish and Wildlife	1.6 USC § 661 40 CFR § 6.302	Remedial actions shall protect the fish and wildlife of the area.

TABLE A-3

Action-Specific Applicable or Relevant and Appropriate Requirements for Site 5 Soil

Action	Citation	Requirement Description
Remedial Actions	49 ARS § 282	Remedial actions must (a) assure the protection of public health and welfare and the environment; (b) to the extent practicable, provide for the control and management of clean-up of the hazardous substance to allow for the maximum beneficial use of the waters of the state; and (c) be cost-effective over the period of potential exposure to such hazardous substance.
Air Emissions	Air Pollution Control Permits (ARS 49-426)	Requires installation and operating permits to be obtained for equipment or devices that may cause or contribute to air pollution. Operating permits may contain conditions that are consistent with the federal Clean Air Act (CAA).
	Pima County Air Quality Control Regulation 17:12.090 Sub-Paragraph E	This ordinance requires a proposal of reasonably available control technology in the event that a stationary source has the potential to emit a total of 2.4 pounds per day of volatile organic compounds (VOCs).
	CAA 42 USCA 7401-7642, 40 Code of Federal Regulations (CFR) 50-99. National Primary and Secondary Ambient Air Quality Standards (40 CFR Part 50)	Establishes National Ambient Air Quality Standards for ambient air quality to protect public health and welfare.
	Standards of Performance for New Stationary Sources (40 CFR 60.1-60.18, 60. 50-60.54)	Sets New Source Performance Standards for emissions from new or modified sources. The standards reflect the degree of emission reduction achievable through demonstrated best technology, considering costs and a number of other factors.

TABLE A-3

Action-Specific Applicable or Relevant and Appropriate Requirements for Site 5 Soil

Action	Citation	Requirement Description
	Air Stripper Emissions EPA OSWER Directive 9355.0-2.8	Controls are needed on most sources with an actual emissions rate of 3 pounds per hour or 15 pounds per day or a potential rate of 10 tons per year of total VOCs because VOCs are ozone precursors. The basis of the need for control indicates that this guidance should be considered for soil vapor extration emissions as well as air stripper emissions.
Treatment, Storage, and Disposal of Hazardous Wastes	Generators of Hazardous Waste (40 CFR 262) and AAC R18-8-262	Requires generators who treat, store, or dispose of hazardous waste to obtain an EPA identification number (40 CFR 262.12); prepare manifests for transportation of hazardous waste for off-site treatment, storage, or disposal (40 CFR 262.20-262.23); comply with pretransport requirements (40 CFR 262.40-262.43); and maintain records and submit reports 40 CFR 262.40-262.43. These requirements would be applicable to alternatives involving either on- or off-site treatment, storage, or disposal. These requirements are triggered when ground water activated carbon is used for remediation of VOCs.
Storage of Hazardous Waste/Contaminated Carbon	Subpart I - Use and Management of Containers (40 CFR 264.170-178)	Containers of Resource Conservation and Recovery Act hazardous waste must be maintained in good condition, compatible with hazardous wastes to be stored, and closed during storage except to add or remove waste.
	ARS 49-921 et seq and AAC R18-8-260 et seq.	Container areas should be inspected weekly for deterioration. Secondary containment system is required for storage of hazardous waste over 90 days.
Transportation of Hazardous Waste	40 CFR 263	Transportation must be in a licensed hazardous waste hauler. In the event of a discharge during transportation, the transporter must take immediate action to protect human health and the environment (40 CFR 263.30) and clean up the discharge such that it no longer presents a hazard (40 CFR 263.31). Residual waste being transported to an off-site disposal facility would be subject to this requirement.

TABLE A-3

Action-Specific Applicable or Relevant and Appropriate Requirements for Site 5 Soil

Action	Citation	Requirement Description
Worker Health and Safety	Occupational Safety and Health Act (OSHA) 29 USC 651-678, 19 CFR 1910	OSHA requirements under 19 CFR 1910-120 are applicable to worker exposures during response actions at Comprehensive Environmental Response, Compensation, and Liability Act sites, except in states that enforce equivalent or more stringent requirements.

APPENDIX B

ERM-WEST, INC.'S LETTER DATED MARCH 6, 1996

ERM-West, Inc.

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March 6, 1996

Mr. Michael Grimm
Air National Guard
HQ/ANG/CEVR
Building R-47
3500 Fetchet Avenue
Andrews Air Force Base, Maryland 20762

ERM

SUBJECT: Response to Public Comments on Soil Cleanup Goals, Arizona Air National Guard Base, Tucson, Arizona

Dear Mr. Grimm:

This letter summarizes the results of ERM-West, Inc.'s, (ERM's) additional analyses in response to comments on the selection of the soil cleanup target of 200 micrograms per liter-air (µg/l) for trichloroethylene (TCE) in Site 5 soils at the Arizona Air National Guard (AANG) Base, in Tucson, Arizona. This letter presents information regarding the following two items of public concern:

- The projected ground water impact associated with selecting an alternative cleanup goal of less than 200 µg/l for TCE in Site 5 soil vapor; and
- The projected additional time and costs to achieve an alternative cleanup goal of less than 200 µg/l.

EVALUATION OF ALTERNATIVE CLEANUP GOALS

ERM used a vadose zone model, VLEACH, and a ground water mixing cell model to evaluate alternative cleanup goals for Site 5 soils to determine the resulting ground water concentrations. The modeling effort was performed using assumptions outlined in the *Final Focused Feasibility Study for Site 5 Soils* (November 1995). During the original VLEACH evaluation for the Feasibility Study (FS), three alternative cleanup goals were evaluated (500, 250, and 125 µg/l). The projected ground water impacts under the 500 µg/l scenario exceeded the 5 µg/l insitu cleanup goal for TCE in ground water. The 250 µg/l scenario resulted in a projected ground water impact of 4.8 µg/l, approximately equal to the insitu cleanup goal. The projected ground water impact under the

125 μg/l scenario was 3.6 μg/l. A target concentration of TCE in soil vapor of 200 μg/l for soils was recommended in the FS. This concentration was intermediate to the two scenarios that resulted in an impact to ground water of less than 5 μg/l.

During the public presentation of the Proposed Plan for Site 5 soils, a member of the community (Larry Van Diver) requested that ANG evaluate cleanup goals less than the selected 200 μg/l cleanup goal for Site 5 soils. In response to this request, ERM modeled five additional alternative target concentration scenarios for TCE concentrations in soil vapor, as follows: 100, 75, 50, 25, and 1 μg/l. The results of the VLEACH analysis are included in Attachment A.

As would be expected, ground water impacts based on these alternative scenarios are all less than the insitu ground water cleanup goal of 5 μg/l. At a soil vapor cleanup goal of less than about 25 μg/l, the ground water impact would not be discernable based on the typical laboratory detection limit for TCE in ground water of 0.5 μg/l.

EVALUATION OF CLEANUP COSTS

In the FS, the cost to operate the system through site closure was estimated. A cost estimate of $470, 000 was provided for the total operational cost. This cost was expected to be distributed over the 5-year time frame (5 years was shown as a worst-case estimate, the actual time frame could be as short as a few months). ERM ran a modified version of the Hyperventilate Soil Vapor Extraction computer model to estimate the amount of TCE removed from the ground throughout the cleanup period, based on our current knowledge of air/soil permeability, soil gas concentrations and other factors. A graph was prepared to present information regarding reductions in soil vapor concentrations versus cumulative operational costs incurred.

We estimate that the operational cost to reach the VLEACH clean-up level of 200 μg/l will be approximately $38,000. The cost to reduce the concentrations one more order of magnitude (i.e., from 200 μg/l to 20 μg/l) is expected to be over $400,000.

DISCUSSION

It should be noted that even if 100 percent of the TCE in Site 5 soils is removed and remediated today, ground water underlying Site 5 would still contain detectable levels of TCE. Based on review of actual ground water data, it appears that if all of the TCE was removed from Site 5 soils, the ground water underlying the site would still contain about TCE at approximately 5 µg/l or a little higher. This is because ground water flow moving onto the Base from off-site locations currently contains TCE concentrations exceeding the ground water cleanup goal of 5 µg/l. As you know, ground water underlying Site 5, as well as ground water underlying the rest of the Base, is subject to an upcoming ground water extraction and treatment program. The objective of the treatment system is to capture and contain ground water containing TCE concentrations in excess of the ground water cleanup goal. The projected capture zone for this treatment system includes ground water in the Site 5 area. This ground water remediation program is scheduled to be implemented during early 1997.

Further consideration of the issue of cleanup goals for TCE in Site 5 soil vapor suggests that application of highly stringent cleanup goals would be cost prohibitive, while providing no significant additional protection to ground water quality. It is recommended that the decision process to discontinue soil vapor extraction and treatment be implemented as proposed in the FS. As described in the FS Report, the 200 µg/l soil gas cleanup goal is only used as a guide to determine when additional VLEACH modeling should be performed. Actual soil gas data collected from the vapor monitoring wells at Site 5 will be used in the model to determine if TCE concentrations in soil gas no longer pose a threat to ground water. If the modeling results indicate that a continuing threat still exists, then soil vapor extraction and treatment will continue. On the other hand, if the modeling results indicate that the ground water threat has been eliminated, then soil vapor extraction will be discontinued. As indicated in the FS report, additional soil vapor monitoring will be performed after discontinuing vapor extraction to ensure that TCE concentrations in soil vapor remain at sufficiently low concentrations to be protective of ground water quality.

As we discussed this morning, while it would be preferable to have every site in the country remediated to pristine conditions, there are limited funds that the Government has allocated for its site remediation projects. In our opinion it would be more appropriate to save the additional $400,000 that would be required to reach 20 μg/l in soil gas, and use these funds to remediate other sites that pose a more significant risk to groundwater quality. Furthermore, the vast majority of the TCE in groundwater under the AANG Base is from another upgradient source. Perhaps it would be a better use of funds for the responsible parties to find that source and remediate it.

Sincerely,

ERM-WEST, INC.

for

Robin G. Weesner, R. G.
Project Manager

James E. Quinn, P.E.
Program Director

RGW/JEQ:cac/6010

cc: Larry Van Diver
Craig Cooper, EPA Region IX
Don Atkinson, ADEQ
Craig Kafura, ADEQ

ATTACHMENT A

RESULTS OF ADDITIONAL MODELING

TABLE 1

Results of ERM Modeling

			Cleanup Goal Alternatives					
Existing Condition Based on ORNL/ETS Modelling			Alternative 1		Alternative 2		Alternative 3	
Maximum Concentration 3,000 µg/l Soil Gas			500 µg/l Soil Gas		250 µg/l Soil Gas		125 µg/l Soil Gas	
Time (years)	Flux Rate g/day/ft2*E-06	Ground Water Concentration µg/l	Flux Rate g/day/ft2*E-06	Ground Water Concentration µg/l	Flux Rate g/day/ft2*E-06	Ground Water Concentration µg/l	Flux Rate g/day/ft2*E-06	Ground Water Concentration µg/l
10	1.77	5.3	1.72	5.1	1.62	4.8	1.19	3.6
20	1.76	5.2	1.71	5.1	1.61	4.8	1.18	3.5
30	1.74	5.2	1.69	5.0	1.6	4.8	1.17	3.5
40	1.71	5.1	1.66	5.0	1.57	4.7	1.15	3.4
50	1.68	5.0	1.63	4.9	1.54	4.6	1.13	3.4
60	1.64	4.9	1.6	4.8	1.51	4.5	1.1	3.3
70	1.61	4.8	1.56	4.7	1.48	4.4	1.08	3.2
80	1.58	4.7	1.53	4.6	1.45	4.3	1.06	3.2
90	1.54	4.6	1.5	4.5	1.42	4.2	1.04	3.1
100	1.51	4.5	1.47	4.4	1.39	4.1	1.02	3.0

	Cleanup Goal Alternatives							
	Alternative 4		Alternative 5		Alternative 6		Alternative 7	
	100 µg/l Soil Gas		75 µg/l Soil Gas		50 µg/l Soil Gas		25 µg/l Soil Gas	
Time (years)	Flux Rate g/day/ft2*E-06	Ground Water Concentration µg/l	Flux Rate g/day/ft2*E-06	Ground Water Concentration µg/l	Flux Rate g/day/ft2*E-06	Ground Water Concentration µg/l	Flux Rate g/day/ft2*E-06	Ground Water Concentration µg/l
10	0.95	2.8	0.71	2.1	0.47	1.4	0.24	0.7
20	0.94	2.8	0.71	2.1	0.47	1.4	0.24	0.7
30	0.93	2.8	0.70	2.1	0.46	1.4	0.23	0.7
40	0.92	2.7	0.69	2.1	0.46	1.4	0.23	0.7
50	0.90	2.7	0.68	2.0	0.45	1.3	0.23	0.7
60	0.88	2.6	0.66	2.0	0.44	1.3	0.22	0.7
70	0.87	2.6	0.65	1.9	0.43	1.3	0.22	0.7
80	0.85	2.5	0.64	1.9	0.42	1.3	0.21	0.6
90	0.83	2.5	0.62	1.9	0.42	1.3	0.21	0.6
100	0.81	2.4	0.61	1.8	0.41	1.2	0.20	0.6

TABLE 1

Results of ERM Modeling

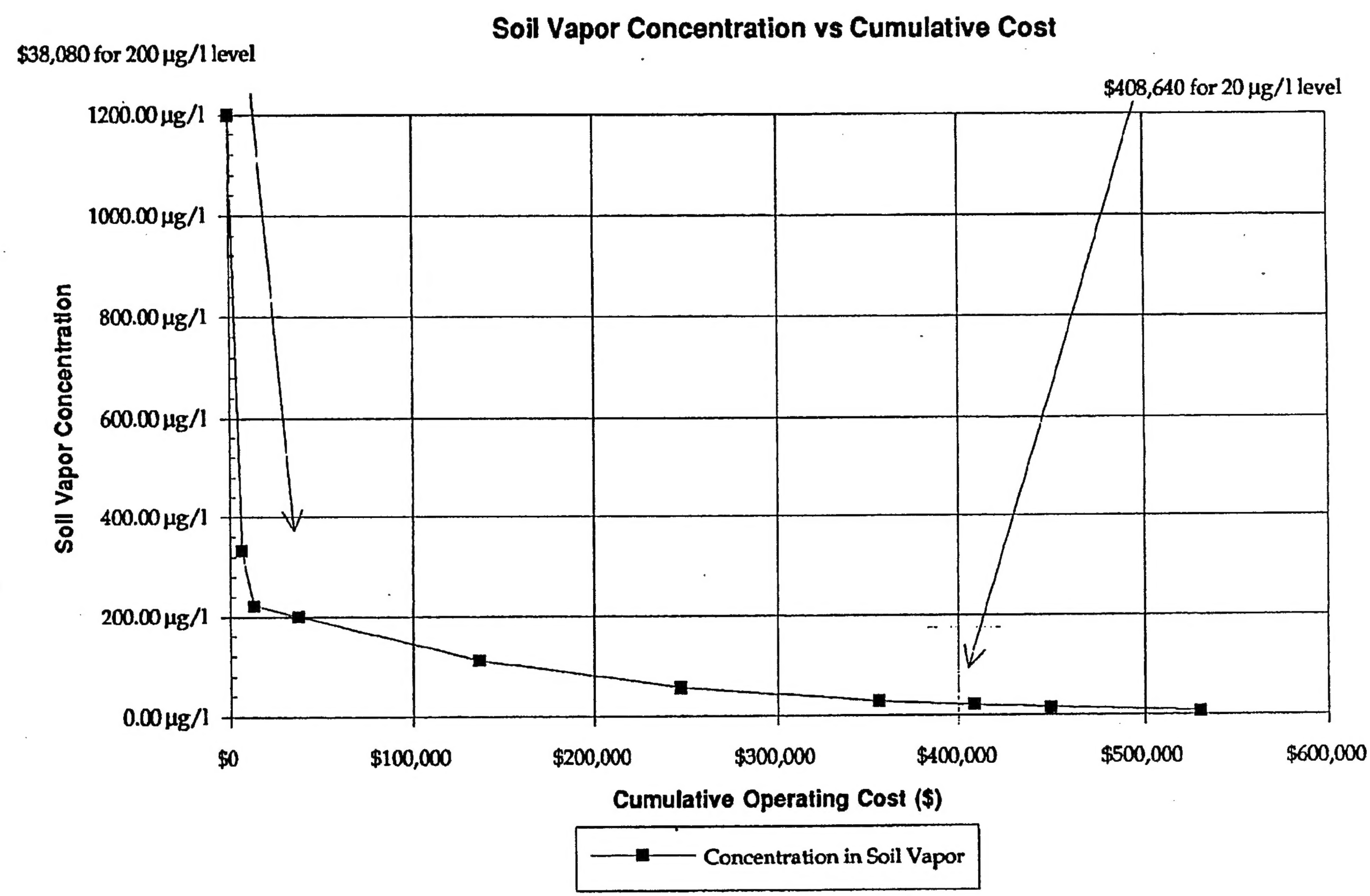
	Cleanup Goal Alternatives			
	Alternative 8		Alternative 9 (Recommended)	
	1 µg/l Soil Gas		200 µg/l Soil Gas	
Time (years)	Flux Rate g/day/ft2 E-06	Ground Water Concentration µg/l	Flux Rate g/day/ft2 E-06	Ground Water Concentration µg/l
10	0.0095	0.028	1.60	4.8
20	0.0094	0.028	1.59	4.7
30	0.0093	0.028	1.57	4.7
40	0.0092	0.027	1.55	4.6
50	0.0090	0.027	1.52	4.5
60	0.0088	0.026	1.49	4.4
70	0.0087	0.026	1.46	4.4
80	0.0085	0.025	1.43	4.3
90	0.0083	0.025	1.40	4.2
100	0.0081	0.024	1.37	4.1

Assumptions:
Same parameters used in the VLEACH model for Site 5 TCE as provided by ORNL/ETS in Appendix N (Table 2-1) of the Final Remedial Investigation Report.
Recharge Rate assumed to be 0.7 inches per year.
Same parameters used in mixing cell model as provided by ORNL/ETS is in Appendix N (Table 6-1) of the Final Remedial Investigation Report.
Upper subunit hydraulic conductivity assumed to be 100 feet per day.

Polygons used in the VLEACH model as follows:

	TCE Concentration, µg/kg		
Simulation	Inner Zone	Intermediate Zone	Outer Zone
ORNL/ETS	328	163	65
Alternative 1	197	163	65
Alternative 2	98	98	65
Alternative 3	49	49	49
Alternative 4	39	39	39
Alternative 5	29	29	29
Alternative 6	20	20	20
Alternative 7	9.8	9.8	9.8
Alternative 8	0.39	0.39	0.39
Alternative 9	78	78	65

g = grams
ft2 = feet squared
E-06 = multiply by a factor of 10-6
µg/l = micrograms per liter
µg/kg = micrograms per kilogram
ORNL/ETS = Oak Ridge National Laboratory/Environmental Technology Section
TCE = Trichloroethylene



Soil Vapor Concentration vs Cumulative Cost
$38,080 for 200 µg/l level
$408,640 for 20 µg/l level
1200.00 µg/l
1000.00 µg/l
800.00 µg/l
600.00 µg/l
400.00 µg/l
200.00 µg/l
0.00 µg/l
Soil Vapor Concentration
$0
$100,000
$200,000
$300,000
$400,000
$500,000
$600,000
Cumulative Operating Cost ($)
Concentration in Soil Vapor